

**IN THE UNITED STATES DESIGNATED OFFICE (DO/US)**

In re:	DeSimone <i>et al.</i>	Confirmation No.:	3338
Appl No.:	10/572,764	Group Art Unit:	1645
Filed:	May 16, 2007		
For:	PHOTOCURABLE PERFLUOROPOLYETHERS FOR USE AS NOVEL MATERIALS IN MICROFLUIDIC DEVICES		

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT  
UNDER 37 C.F.R. § 1.97**

Sir:

Attached is a Supplemental Form PTO-1449 listing several documents that were first cited in the Supplementary European Search Report for the corresponding European Application Number 04784924.5-2115 not more than three months prior to the filing of this Statement. In this regard, Applicant notes that the Search Report was not received by any individual designated by 37 CFR 1.56(c) more than three months prior to the filing of this Information Disclosure Statement.

The Search Report is enclosed along with any cited foreign patent documents and non-patent literature documents in accordance with 37 CFR 1.98(a)(2).

Also enclosed is an Office Action issued June 14, 2010, in a co-pending case, U.S. Appl. No. 10/589,222. Applicant points the Examiner's attention to the Office Action and the art cited therein. The '222 application published on November 29, 2007, as US 2007-0275193.

Applicant also points the Examiner's attention to co-pending, related U.S. Appl. No. 11/825,482 and its file history. The '482 application published on July 2, 2009, as US 2009-0165320.

In re: DeSimone *et al.*  
Appl No.: 10/572,764

It is requested that the Examiner consider these documents and officially make them of record in accordance with the provisions of 37 C.F.R. § 1.97 and Section 609 of the MPEP. By identifying the listed documents, Applicant in no way makes any admission as to the prior art status of the listed documents, but is instead identifying the listed documents for the sake of full disclosure.

Respectfully submitted,

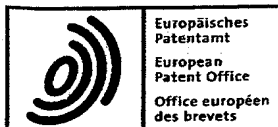
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- 5. Aug. 2010	
Frist	13.08.10 u04

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Date
04.08.10

Reference P20529DrB/her	Application No./Patent No. 04784924.5 - 2115 / 1694731 PCT/US2004031274
Applicant/Proprietor UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL, et al	

### Communication

The European Patent Office herewith transmits as an enclosure the supplementary European search report under Article 153(7) EPC for the above-mentioned European patent application.

If applicable, copies of the documents cited in the European search report are attached.

- ☒ 4 additional set(s) of copies of the documents cited in the European search report is (are) enclosed as well.

### Refund of the search fee

If applicable under Article 9 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.



# SUPPLEMENTARY PARTIAL EUROPEAN SEARCH REPORT

Application Number

under Rule 62a and/or 63 of the European Patent Convention.  
This report shall be considered, for the purposes of  
subsequent proceedings, as the European search report

EP 04 78 4924

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,P	WOOD C D ET AL: "New fluoropolymer materials" JOURNAL OF FLUORINE CHEMISTRY, ELSEVIER, NL LNKD- DOI:10.1016/J.JFLUCHEM.2004.09.029, vol. 125, no. 11, 11 November 2004 (2004-11-11), pages 1671-1676, XP004669202 ISSN: 0022-1139 * figure 3 * * Scheme 1 *	1-25, 27-35	INV. C08J5/20 H01M4/88 H01M8/10 B05D5/12 C08J5/12 C09D171/02
A	PRIOLA A ET AL: "UV-CURABLE SYSTEMS CONTAINING PERFLUOROPOLYETHER STRUCTURES: SYNTHESIS AND CHARACTERISATION" MACROMOLECULAR CHEMISTRY AND PHYSICS, WILEY-VCH VERLAG, WEINHEIM, DE LNKD- DOI:10.1002/MACP.1997.021980618, vol. 198, no. 6, 1 June 1997 (1997-06-01), pages 1893-1907, XP000696483 ISSN: 1022-1352 * abstract *	1-25, 27-35	TECHNICAL FIELDS SEARCHED (IPC)  C08J C09D H01M B05D B01L B81B G03F
The supplementary search report has been based on the last set of claims valid and available at the start of the search.			
<b>INCOMPLETE SEARCH</b>			
The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.			
Claims searched completely :			
Claims searched incompletely :			
Claims not searched :			
Reason for the limitation of the search: see sheet C			
Place of search <b>Munich</b>		Date of completion of the search <b>23 July 2010</b>	Examiner <b>West, Nuki</b>
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			



INCOMPLETE SEARCH  
SHEET C

Application Number  
EP 04 78 4924

Following a communication under Rule 62a EPC dated 20.05.2010, the applicant has with letter of 15.07.2010 requested that the search be limited to claims 1-25 and 27-35.

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Claim(s) completely searchable:  
1-25, 27-35

Claim(s) not searched:  
26, 36-171

Reason for the limitation of the search:

Following a communication under Rule 62a EPC dated 20.05.2010, the applicant has with letter of 15.07.2010 requested that the search be limited to claims 1-25 and 27-35.

EP 04 78 4924

23-07-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002160139 A1	31-10-2002	US 2006093836 A1	04-05-2006

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/589,222	05/11/2007	Joseph M. DeSimone	035052/339400	5780
7590 W. Murray Spruill Alston & Bird LLP Bank of America Plaza 101 South Tryon Street, Suite 4000 Charlotte, NC 28280-4000			EXAMINER HU, HENRY S	
			ART UNIT 1796	PAPER NUMBER
			MAIL DATE 06/14/2010	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/589,222	<b>Applicant(s)</b> DESIMONE ET AL.	
	<b>Examiner</b> HENRY S. HU	<b>Art Unit</b> 1796	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on Election of April 12, 2010.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-238 is/are pending in the application.
- 4a) Of the above claim(s) 24-238 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-238 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 May 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

1. This Application **10/589,222** filing on May 11, 2007 is from **371/PCT/ US2005/04421** with a US provisional priority at February 13, 2004. Applicants have elected **Claims 1-23 (Group I) without traverse**, which is in response to Restriction requirement filed on March 12, 2010. **Pre-Amendment** and **six IDS**' (total 17 pages) are filed so far. With such a pre-amendment, only the typographical or grammatical error on claims is corrected, while no claim is cancelled or added (see pages 2-3 of Remarks). Examiner **accepts Applicants' ten-sheet Drawing with Figures 1-10** filed along with this Application (a brief description is on pages **8-9**). **Claims 1-238 with twelve independent claims (Claims 1, 24, 34, 53, 120, 128, 139, 146, 163, 187, 208 and 224) are now pending**, while non-elected Claims 24-238 (Groups II-XII) are all withdrawn from consideration. An action follows. No international search report is found in Applicants' **two** papers including **WO 2005/084191 A2 to DeSimone et al.** and **WO 2005/030822 A2 to DeSimone et al.**

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. The limitation of parent **Claim 1** in present invention relates to ***a microfluidic device comprising a perfluoropolyether (PFPE) material, wherein the PFPE material is prepared from a liquid PFPE precursor material having a characteristic selected from the group consisting of:***

- (i) a viscosity greater than about 100 centistokes (cSt),***

(ii) a viscosity less than about 100 cSt, provided that the liquid PFPE precursor material having a viscosity less than 100 cSt is not a free-radically photocurable PFPE material, and

(iii) combinations thereof.

See other limitations of dependent **Claims 2-23**.

5. **Claims 1 and 23 are rejected** under 35 U.S.C. 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Peterson et al. (US 6,335,224 B1)** or under 35 U.S.C. 102(e) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Peterson (US 6,956,283 B1**, which is a CIP of US 6,335,224 B1)), **Summersgill et al. (US 2005/0255003 A1)** or **Chiu et al. (US 2005/0048581 A1)**.

Applicant has claimed in elected parent **Claim 1** an unexpected way of obtaining a microfluidic device comprising a perfluoropolyether (PFPE) material. Said **PFPE material is prepared from a liquid PFPE precursor material** having a property “selected from the group consisting of”: (i) a viscosity greater than about 100 centistokes (cSt), (ii) a viscosity less than about 100 cSt, provided that the liquid PFPE precursor material having a viscosity less than 100 cSt is not a free-radically photocurable PFPE material, and (iii) combinations thereof. According to MPEP, the scope of perfluoropolyether (PFPE) material or precursor material includes any material as long as it comprises PFPE polymer or PFPE unit-containing polymer.

6. **Peterson (224), Peterson (283, the CIP case), Summersgill and Chiu** each has disclosed a process for protecting a **microelectronics device** during device packaging by using a removable protective coating film on sensitive area. The protective coating film on such a device would ideally be water-insoluble, vacuum-deposited, strong, pure, inert, defect-free, dry-etchable and conformal (see Peterson (224) at column 5, line 7-9). The film is made from a parylene-like precursor vacuum deposition such as CVD or PECVD or made from **a liquid PFPE precursor** For instance, see Peterson (224) at abstract, line 1-21; column 5, line 7-22; column 8, line 1-12; column 11, line 7-9. The microelectronics device may be **microfluidic systems such as used in Chemical-Lab-on-a-chip systems**. See Peterson (224) at **Figure 1A** and column 4, line 55-57; also see the **component 14** to be used as the protective coating in **Figures 1B and 1C**. For other instance, see **Summersgill** for the use of Fluorolink S10, which is a di-triethoxysilane based on a **linear perfluoropolyether** backbone. See paragraph 0089; particularly see line 3 for microfluidic channel walls and line 10-13 for Fluorolink S10. See **Chiu** for the use of liquid perfluoropolyether (PFPE) or its precursors at paragraph 0023; see the application as microfluidic channel at paragraphs 0021-0022.

7. Regarding "liquid state" processing, some viscosity is always required when liquid state processing is used. Therefore, Petersons, Summersgill and Chiu each is only silent about using liquid PFPE material or precursor material carrying the specific viscosity being higher than 100 cSt or being lower than 100 cSt.

8. In light of the fact that the prior art and the present invention recite substantially identical liquid PFPE material or precursor material as well as the purpose to make a protective coating film by liquid state processing, a reasonable basis exists to believe that such a liquid PFPE material or precursor material used by Petersons, Summersgill and Chiu inherently possess the same or at least similar viscosity property. Since PTO does not have proper means to conduct experiments, the burden of proof is now shifted to Applicants to show otherwise. *In re Best*, 195 USPQ 430 (CCPA 1977).

It has been held that where applicant claims a composition in terms of function, property or characteristic where said function is not explicitly shown by the reference and where the examiner has explained why the function, property or characteristic is considered inherent in the prior art, it is appropriate for the examiner to make a rejection under both the applicable section of 35 USC 102 and 35 USC 103 such that the burden is placed upon the applicant to provide clear evidence that the respective compositions do in fact differ. *In re Best*, 195 USPQ 430, 433 (CCPA 1977); *In re Fitzgerald et al.*, 205 USPQ 594, 596 (CCPA 1980).

9. Dependent **Claim 23** relates to the light transparency of PFPE material, the issue of inherent property is thereby applied for rejecting Claim 23.

10. **Claims 2-14 and 19-22 are rejected** under 35 U.S.C. 103(a) as being unpatentable over **Peterson et al.** (US 6,335,224 B1), **Peterson** (US 6,956,283 B1), **Summersgill et al.** (US 2005/0255003 A1) and **Chiu et al.** (US 2005/0048581 A1) in combination or alone, in view of **DeSimone et al.** (US 2006/0083971 A1 with a US provisional priority at January 23, 2004).

The discussion of the disclosures of the prior art of Petersons Summersgill and Chiu for Claims 1 and 23 of this office action is incorporated here by reference. Regarding **Claims 2-14**

**and 19-22, Peterson (224), Peterson (283), Summersgill and Chiu** in combination or alone is silent about **two** things including: (A) using the functionalized PFPE precursor as disclosed in Claims 2-14 and 19-22, and (B) the motivation to do so. **DeSimone (971) along with the references cited therein** can teach such two subject matters.

11. For one instance, in the course of using liquid materials for making electrochemical cells such as microfluidic electrochemical cell, a liquid type photocurable perfluoropolyether (PFPE) as precursor material can be used. By doing so, the advantage is that such a liquid process is processable and convenient. See title; abstract; paragraphs 0001-0007. Also see the use of many varieties of PFPE precursors throughout the specification.

12. With such an advantage, the skilled artisan would make the obvious connection to apply such two subject matters as described by DeSimone into Petersons, Summersgill and Chiu's microfluidic device.

13. **Claims 15-18 are rejected** under 35 U.S.C. 103(a) as being unpatentable over **Peterson et al. (US 6,335,224 B1), Peterson (US 6,956,283 B1), Summersgill et al. (US 2005/0255003 A1) and Chiu et al. (US 2005/0048581 A1)** in combination or alone, in view of **two** references including **Weers et al. (US 6,204,296 B1) and Linert et al. (US 6,737,489 B2)**.

The discussion of the disclosures of the prior art of Petersons Summersgill and Chiu for Claims 1 and 23 of this office action is incorporated here by reference. Regarding **Claims 15-**



**18, Peterson (224), Peterson (283), Summersgill and Chiu** in combination or alone is silent about two things including: (A) using a two-component PFPE precursor system, which comprises a mixture of two functionalized PFPE components blended in a stoichiometric ratio, and (B) the motivation to do so. Two references including **Weers and Linert** in combination can teach such two subject matters.

14. For one instance, **Weers** teaches that PFEB (**perfluoropolyether bromide**, which is falling in the same scope of “functionalized” PFPE) can be particularly used together with regular liquid PFPE or its precursor. By doing so, the advantage is to better stabilize fluorocarbon emulsion (column 13, line 43-49). For the other instance, **Linert** also teaches that a fluorochemical composition may comprise a linear PFPE-containing polymer with other fluoropolymer (see paragraphs 0027-0034 and 0036-0037; particularly see paragraph 0029, line 10-11). By doing so, the advantage is that such a composition can be very useful for rendering a fibrous substrate oil and/water repellent (abstract, line 1-10).

15. With such an advantage, the skilled artisan would make the obvious connection to apply such two subject matters as described by Weers and Linert into Petersons, Summersgill and Chiu’s microfluidic device.

### ***Conclusion***

16. Any inquiry concerning this communication or earlier communication from the examiner should be directed to **Dr. Henry S. Hu** whose telephone number is (571) 272-1103. The

Art Unit: 1796

examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Vasu Jagannathan, can be reached on (571) 272-1119. The **fax** number for the organization where this application or proceeding is assigned is **(571) 273-8300** for all regular communications. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Peter D. Mulcahy/  
Primary Examiner, Art Unit 1796

/Henry S. Hu/  
Examiner, Art Unit 1796

June 11, 2010